Kansas Agricultural Experiment Station Research Reports

Volume 4
Issue 8 *Southwest Research-Extension Center Reports*

Article 18

2018

Efficacy of Zest, Resolve, and Harmony Tank Mixes Used Sequentially in Irrigated Acetolactase Synthase (ALS)-Resistant Grain Sorghum

R. S. Currie
Kansas State University, rscurrie@ksu.edu

P. W. Geier
Kansas State University, pgeier@ksu.edu

Recommended Citation

Currie, R. S. and Geier, P. W. (2018) "Efficacy of Zest, Resolve, and Harmony Tank Mixes Used Sequentially in Irrigated Acetolactase Synthase (ALS)-Resistant Grain Sorghum," *Kansas Agricultural Experiment Station Research Reports*: Vol. 4: Iss. 8. https://doi.org/10.4148/2378-5977.7638

Efficacy of Zest, Resolve, and Harmony Tank Mixes Used Sequentially in Irrigated Acetolactase Synthase (ALS)-Resistant Grain Sorghum

Abstract

Palmer amaranth control was best when Cinch was applied preemergence (PRE) followed by Zest plus atrazine postemergence (POST) or when Cinch ATZ was applied early postemergence (EPOST) with Zest and atrazine. Most herbicides provided excellent crabgrass control. Shattercane control was excellent with all herbicides except Cinch ATZ applied PRE. Minor sorghum stunting was observed with some treatments three days after application, but sorghum had completely recovered within one week. Herbicide-treated grain sorghum yielded 48 to 93 bu/a more grain than untreated sorghum. Sorghum yields were best when Cinch or Cinch ATZ was applied PRE followed by Zest and atrazine POST, or when Cinch ATZ was applied with Zest and atrazine EPOST.

Keywords

Herbicide-resistant sorghum

K-STATE Research and Extension

2018 SWREC Agricultural Research

Efficacy of Zest, Resolve, and Harmony Tank Mixes Used Sequentially in Irrigated Acetolactase Synthase (ALS)-Resistant Grain Sorghum

R.S. Currie and P.W. Geier

Summary

Palmer amaranth control was best when Cinch was applied preemergence (PRE) followed by Zest plus atrazine postemergence (POST) or when Cinch ATZ was applied early postemergence (EPOST) with Zest and atrazine. Most herbicides provided excellent crabgrass control. Shattercane control was excellent with all herbicides except Cinch ATZ applied PRE. Minor sorghum stunting was observed with some treatments three days after application, but sorghum had completely recovered within one week. Herbicide-treated grain sorghum yielded 48 to 93 bu/a more grain than untreated sorghum. Sorghum yields were best when Cinch or Cinch ATZ was applied PRE followed by Zest and atrazine POST, or when Cinch ATZ was applied with Zest and atrazine EPOST.

Introduction

Zest (nicosulfuron) and Resolve (rimsulfuron) are herbicides that have long been used in corn to control weedy sorghum species as well as other grasses. Using selections from weedy sorghum species that had developed resistance to the ALS mode of action, commercial sorghum hybrids have been developed. Although these compounds provide excellent control of weedy sorghum species they can be weak on many broadleaf weeds and some grassy species beyond a certain size. Harmony (thifensulfuron), another ALS herbicide long used for weed control in wheat, was also included. Therefore, it was the objective of this study to compare tank mixes of herbicides to augment the weed spectrum of Zest and Resolve.

Experimental Procedures

An experiment was conducted at the Kansas State University Southwest Research-Extension Center near Garden City, KS, to evaluate weed control and crop response with acetolactase-synthase (ALS) inhibiting herbicides Zest, Resolve, and Harmony in irrigated ALS-resistant grain sorghum. Atrazine and Cinch (*S*-metolachlor) were also included to augment weaknesses in these compounds. Herbicides were applied preemergence (PRE), early postemergence (EPOST), or PRE followed by postemergence (POST). The experimental area was overseeded with crabgrass and Rox Orange forage sorghum (to simulate shattercane) to supplement naturally occurring weed pressure

prior to planting sorghum. Application, environmental, and weed information is shown in Table 1. A tractor-mounted, compressed-CO_2 sprayer delivering 20 GPA at 30 psi was used to apply all herbicides. Plot size was 10 × 35 feet, arranged in a randomized complete block design with four replicates. Soil was a Beeler silt loam with 2.4% organic matter and pH of 7.6. Visual weed control was determined on July 17 and August 30, 2017, which was 6 and 50 days after the POST treatment (DAPT), respectively. Grain yields were determined on November 1, 2017, by mechanically harvesting the center two rows of each plot and adjusting weights to 14% moisture.

Results and Discussion

Palmer amaranth control at 50 DAPT was best when Cinch was applied PRE followed by Zest plus atrazine POST or when Cinch ATZ was applied EPOST with Zest and atrazine (Table 2). Most herbicides provided 95 to 100% crabgrass control at 6 DAPT, and control was complete regardless of herbicide by 50 DAPT. Shattercane control at 50 DAPT was 95% or more with all herbicides except Cinch ATZ applied PRE (50%). Minor sorghum stunting and chlorosis (11 to 15%) was observed when Cinch ATZ was applied EPOST with Zest and atrazine at three days after application, but sorghum had completely recovered within seven days (data not shown). No other visible sorghum injury was observed. Herbicide-treated grain sorghum yielded 48 to 93 bu/a more grain than untreated sorghum. Sorghum yields were best (96 to 105 bu/a) when Cinch or Cinch ATZ was applied PRE followed by Zest and atrazine POST, or when Cinch ATZ was applied with Zest and atrazine EPOST.

Table 1. Application information

Application timing	Preemergence	Early postemergence	Postemergence
Application date	June 14, 2017	July 7, 2017	July 11, 2017
Air temperature (°F)	68	74	75
Relative humidity (%)	41	51	49
Soil temperature (°F)	72	71	71
Wind speed (mph)	5	4	4
Wind direction	North-northwest	East	South
Soil moisture	Good	Good	Excellent
Palmer amaranth			
Height (inch)	---	2	4
Density (plants/ft^2)	0	3.3	3.3
Crabgrass			
Height (inch)	---	1	2
Density (plants/ft^2)	0	2.3	1.4
Shattercane			
Height (inch)	---	3	3
Density (plants/ft^2)	0	0.5	0.5

Table 2. Efficacy of single and sequential herbicides in acetolactase synthase-resistant grain sorghum

			Palmer amaranth		Crabgrass		Shattercane		
Treatment[a]	Rate	Timing[b]	6 DAPT[c]	50 DAPT	6 DAPT	50 DAPT	6 DAPT	50 DAPT	Sorghum yield
			% Visual						bu/a
Untreated	---		0	0	0	0	0	0	11.8
Cinch ATZ	3.2 pt	PRE	93	85	95	100	60	50	80.8
Resolve	0.25 oz	PRE	98	55	73	100	85	95	66.1
Harmony SG	0.125 oz	PRE							
Atrazine	24 oz	PRE							
Zest	0.67 oz	POST							
Atrazine	24 oz	POST							
COC	2%	POST							
AMS	2 lb	POST							
Cinch	1.3 pt	PRE	73	58	100	100	100	100	60.0
Resolve	0.25 oz	PRE							
Harmony SG	0.125 oz	PRE							
Zest	0.67 oz	POST							
COC	2%	POST							
AMS	2 lb	POST							
Cinch ATZ	2.0 pt	PRE	78	86	95	100	85	100	97.2
Zest	0.67 oz	POST							
Atrazine	24 oz	POST							
COC	2%	POST							
AMS	2 lb	POST							
Cinch	1.0 pt	PRE	75	88	100	100	73	100	105.2
Zest	0.67 oz	POST							
Atrazine	24 oz	POST							
COC	2%	POST							
AMS	2 lb	POST							
Cinch ATZ	3.2 pt	EPOST	98	100	99	100	98	100	96.4
Zest	0.67 oz	EPOST							
Atrazine	24 oz	EPOST							
COC	2%	EPOST							
AMS	2 lb	EPOST							
LSD (0.05)			7	12	9	NS	10	12	22.2

[a]AMS = ammonium sulfate. COC = crop oil concentrate.
[b]PRE = preemergence. EPOST = early postemergence. POST = postemergence.
[c]DAPT = days after postemergence application. Evaluation dates were July 7 and August 30, 2017 and harvest date was November 1, 2017.

Figure 1. Untreated control.

Figure 2. Cinch ATZ 3.2 pt/a applied preemergence, 29 days after preemergence treatment.

Figure 3. Resolve 0.25 oz/a plus Harmony SG 0.125 oz/a plus Atrazine 24 oz/a applied preemergence followed by Zest 0.67 oz/a plus Atrazine 24 oz/a plus crop oil concentrate 2% plus ammonium sulfate 2 lb/a applied postemergence, 3 days after postemergence application.

Figure 4. Cinch ATZ 2.0 pt/a applied preemergence followed by Zest 0.67 oz/a plus Atrazine 24 oz/a plus crop oil concentrate 2% plus ammonium sulfate 2 lb/a applied postemergence, 3 days after postemergence application.

Figure 5. Cinch 1.0 pt/a applied preemergence followed by Zest 0.67 oz/a plus Atrazine 24 oz/a plus crop oil concentrate 2% plus ammonium sulfate 2 lb/a applied postemergence, 3 days after postemergence application.